# The chemstyle bundle — Schemes and style for chemistry\*

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#### **Abstract**

The chemstyle bundle provides two packages: chemstyle and chemscheme. Both are intended to help chemists create floating graphics and match published styles.

The chemscheme package consists of two parts, both related to chemical schemes. The package adds a scheme float type to the LATEX default types figure and table. The scheme float type acts in the same way as those defined by the LATEX kernel, but is intended for chemical schemes. The package also provides a method for adding automatic chemical numbering to schemes.

The chemstyle package provides a "one-stop shop" for setting up formatting of LATEX documents following the editorial policies of various chemical journals. It provides a number of handy chemistry-related commands, and loads several support packages to aid the chemist.

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<sup>\*</sup>This file describes version v2.0, last revised 2009/06/06.

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#### 1 Introduction

The chemstyle bundle consists of two parts. The first, the chemstyle package itself, aims to provide an easy and reliable method to set up various document parameters (such as caption formatting), simply by specifying the model journal. The package has also been designed to allow rapid addition of new journal styles. Each style definition is a separate file, and new styles can be added very readily. The formatting system provided by chemstyle are intended for writing a variety of documents. Thus, the stylistic changes made by the package do not seek to reproduce the appearance of printed journal articles. The package aims to be suitable for use in preparing drafts of papers, but also for writing reports, theses and so on.

The second part of the bundle is the chemscheme package, which is loaded automatically by chemstyle. chemscheme undertakes two tasks. First, it provides a floating scheme environment, which acts in the same way as the kernel figure and table floats. Secondly, it interfaces with either the chemcompounds or bpchem packages to allow automatic numbering of chemical compounds inside graphics.

This manual is written to cover both packages. All of the material is relevant to users of the chemstyle package. For those only using chemscheme,

#### 2 Installation

The entire bundle is supplied with the TDS-ready ZIP file, chemstyle.tds.zip. Simply unzip this into your local texmf tree and run your hash program: texhash should work with recent versions of either TEX Live or MiKTEX.

To extract the bundle of files from chemstyle.dtx, run (pdf)TeX on chemstyle.dtx. This will produce all of the package files, and also README.txt. To extract the files and build the documentation, run (pdf)LATeX on chemstyle.dtx: you will need to enable "write18" if you compile in PDF mode.

# 3 Requirements

The chemstyle class requires the following packages:

- amstext (part of the AMS bundle);
- caption;
- either float or floatrow;
- kvoptions (part of the oberdiek bundle);
- either siunitx or Slunits (otherwise no units are defined);
- psfrag;
- varioref (part of the standard tools bundle);
- xspace (part of the standard tools bundle).

These are normally present in the current major TEX distributions, but are also available from The Comprehensive TeX Archive Network.

# 4 The chemstyle package: tools for chemistry

The package recognises a number of key–value options when loading. Some of these are also available in the document body, and are described along with the relevant commands. Options which apply to chemscheme can be given when loading chemstyle and will be applied correctly.

journal

chemstyle is supplied with a number of configuration files, based on the styles adopted by a number of chemistry journals (Table 1). A style can be chosen by loading the package with the journal= $\langle style \rangle$  key.

Table 1: Styles provided by chemstyle

Option	Journals using this style
angew	Angew. Chem., Chem. Eur. J.
jomc	J. Organomet. Chem., Coord. Chem. Rev.
ic	Inorg. Chem.
jacs	J. Am. Chem. Soc.
jcp	J. Phys. Chem. A, J. Phys. Chem. B
orglett	Org. Lett.
rsc	Chem. Commun., Org. Biomol. Chem.
	Dalton Trans.
tetlett	Tetrahedron, Tetrahedron Lett.

\cstsetup

Many of the package options can be altered anywhere in the document, using the \cstsetup macro. This accepts a keyval list and processes it as needed.

# 5 Naming of the references section

chemstyle alters the naming of the references section of a document. By default, chemstyle alters the value of \bibname or \refname (as appropriate) to the form of words chosen by the target journal for the "References" section.

The "References" naming commands are language-aware, *via* the babel interface. Currently, chemstyle includes appropriate labels for babel languages english, german and french. Other languages can be added if appropriate wordings are provided to the author. The naming system is designed to work correctly with both natbib and biblatex.

notes nonetes notesbefore

The package recognises the notes option for controlling how the references section is named. The accepts the values true, false and auto. The Boolean values either enable or disable the addition of "Notes and" to the "References" of the section title. The auto option works in conjunction with the notes2bib package. If notes are added, "Notes and" is included in the section title, whereas if no notes are given the section title remains as "References". The nonotes option is equivalent to notes=false. The second option for this area is notesbefore. This takes true and false only, and sets whether "Notes and References" or "References and Notes" is produced.

#### 5.1 Additional units

\cmc \Hz \molar \Molar \mmHg Both the Slunits and unitsdef packages provide methods for handling a range of units, but do not include a small number of unit macros useful to chemists. In contrast, the siunitx package provides all of these using the synchem module. If Slunits or unitsdef are loaded, chemstyle provides the missing units. On the other hand, if no unit package is loaded, siunitx is loaded and provides the units itself: if siunitx is not available on the system, these macros are not defined.

#### 5.2 The standard state symbol

\standardstate

Related to the above, but not exactly a unit is the \standardstate command. This generates the tricky \standardstate symbol. The symbol will adapt to local sizing.

```
the standard conditions are indicated: \standardstate\\ Common but not correct: $\Delta G_\mathrm{f}^\standardstate$ or $\Delta G_\mathrm{f}{}^\standardstate$ \\ Better: $\Delta_\mathrm{f}G^\standardstate$ \\ Sizing: $\int^{T_{\mathrm{mathrm}}G^\standardstate}$ the standard conditions are indicated: $Common but not correct: \Delta G_f^{\circ} or \Delta G_f^{\circ} Better: \Delta_f G^{\circ} Sizing: \int_{T^{\circ}}^{T_{\mathrm{out}}}
```

#### 5.3 Latin phrases

\latin
\etc
\eg
\ie
\etal
\invacuo

The various Latin phrases commonly used in chemistry are made available as the obvious commands. By altering the definition of \latin, this allows ready switching from italic to Roman typesetting. Notice that \etc, \ie and \eg are aware of trailing periods, and so doubling-up should not occur.

```
        some text
        \latin{some text} \\

        e.g.
        \eg
        \\

        et al.
        \etal
        \\

        etc.
        \etc
        \\

        i.e.
        \ie
        \\

        in vacuo
        \invacuo
        \
```

abbremph

The use of italic for these abbreviations is set by altering the package option abbremph, which takes values true and false.

<sup>&</sup>lt;sup>1</sup>The \standardstate macro is only defined if the user does not have their own version.

```
et al. i.e. \\etal\ \ie \\
et al. i.e. \\cstsetup{abbremph=false}
\\etal\ \ie \\
```

abbrcomma

For American journals, where it is obligatory to follow "e.g." and "i.e." with a comma, the package provides a mechanism for handling this automatically. Thus, when using an appropriate journal style, \eg. \eg. and \eg, will all result in typesetting "e.g.,". The Boolean package option abbroomma controls this.

The \etc and \etal commands are set up on the assumption that they come at the end of a sentence. Hence the spacing after these will default to an intersentence space. If you desire an inter-word space, use the normal methods

```
etc. more text \\
et al. have shown \\etal~have shown
```

phrases nophrases

 $\nPr$ 

\iPr

\nBu

\iBu

\sBu \tBu The definitions of all of the phrases are designed not to overwrite any given by the user *in the preamble*. So, if you have your own \latin macro, it will be used even if you load pgchemstyle. If you encounter any problems, try loading the package with the nophrases option; this option prevents the package even trying to define any of the phrase macros. The phrases option acts as a complement to nopharses, so that phrases=false is the same as nophrases=true.

#### 5.4 Alkyl radicals

There are a few alkyl radicals that come up all of the time. No one seems to have put these into a package, so they are provided here. As you would expect, \iPr gives *i*-Pr, \iBu gives *i*-Bu and \tBu gives *t*-Bu, and so on. The style of the output depends on the journal style specified; most journals seem to favour one version of the abbreviation.

```
The alkyl group could be n-Pr, i-Pr or n-Bu without n-Pr, i-Pr or n-Pu without n-Pr wit
```

These should also work inside the \ce macro of mhchem when if escaped mode:

```
n-Bu_2CH-C(i-Pr)_3 \ce{\nBu\2CH-C(\s\iPr\3)}
```

rademph radhyphen radprefix radsuper The appearance of these radical abbreviations is controlled by the package options rademph, radhyphen, radprefix and radsuper. The journal styles set these automatically, but they can be redefined at any point. The options work as might be expected, and are Boolean switches.

```
cstsetup{
    radhyphen = false,
    radsuper = true}

iPr 'tBu \

cstsetup{
    radhyphen = true,
    radhyphen = true,
    radsuper = false,
    radprefix = false,
    rademph = false
}

iBu \sBu
```

The package can use xspace to automatically insert space after the alkyl radical macros. This is controlled using the xspace option.

# 6 The chemscheme package: graphics for chemistry

### 6.1 Floating schemes

scheme

By default, LATEX defines two float types, figure and table. Synthetic chemists make heavy use of schemes, which need a scheme float type. This is provided by chemscheme, in a manner consistent with the kernel floats.

The package provides a new float type, scheme, accessed in the usual way.

```
\begin{scheme}[ht]
  \includegraphics{scheme-one}
  \caption{A scheme with no compound numbers.}
\end{scheme}
```

The scheme float is designed to behave in the same way as the standard LATEX

Scheme 1: A scheme with no compound numbers.

float environments figure and table. Thus schemes will be placed at the top of a page, where possible. As shown in the example, the use of positional modifiers is allowed. Labelling and referencing schemes also follows the LATEX conventions. chemscheme works hard to emulate the document class in use, and so the exact

behaviour will depend on whether the standard classes, KOMA-Script or memoir are being used.

\schemename

\schemename contains the text used in scheme captions (by default Scheme). This is used in the same manner as \figurename or \tablename to set up the text used in scheme captions.

```
\renewcommand*{\schemename}{Illustration}
\begin{scheme}[ht]
  \includegraphics{scheme-one}
  \caption{A scheme that is not a Scheme!}
\end{scheme}
```

Illustration 2: A scheme that is not a Scheme!

\listofschemes \listschemename To match the \listoffigures and \listoftables macros provided by the LATEX kernel, chemscheme provides a \listofschemes command. This works in the same way as the kernel commands, with the default text stored in the macro \listschemename. The standard output is illustrated below.

#### **List of Schemes**

1	A scheme with no compound numbers	6
2	A scheme that is not a Scheme!	7
3	A scheme with temporary compound numbers	8
4	A scheme with automated compound numbers	Ç
5	A scheme with explicitly numbered temporary labels	Ç
6	A scheme with altered label formatting	10
7	A flush-left scheme	10
8	A flush-right scheme	11

floats

Which method is used to generate the new float is controlled by the floats option, which recognises float, floatrow and memoir. The memoir option is ignored if not using the memoir class, or if chemstyle is in use.<sup>2</sup>

#### 6.2 Reference numbers in graphics

There are a number of packages available for tracking compound reference numbers. The two with the most up to date and comprehensive features are bpchem and chemcompounds. Both allow in-text numbering to be handled automatically. However, neither will allow the use of these numbers directly in schemes, figures, *etc*. Both leave it to the user to manually adapt schemes to match any changes in numbering.

<sup>&</sup>lt;sup>2</sup>memoir is not capable of some of the float manipulation needed by chemstyle.

The chemscheme package provides a mechanism for rectifying this issue. The package makes use of the psfrag package, which means that it can only directly produce DVI output (using LATEX). However, direct PDF output using pdfLATEX is possible: see Section 10.

Getting automated numbers into schemes is a two step procedure. In the first step, schemes (or other graphics) should be prepared as normal and saved as encapsulated postscript (EPS) files. The most popular chemistry drawing package, Chemdraw, is able to do this from the Save As ... dialogue. The positions where the auto-labels should be have to be marked in the EPS file. The marker should consist of an "indicator" that the text is to be replaced, followed by a reference number or letter. For automated substitution, the "indicator" text should be the same in all graphics.

\schemeref

In the second step, the command \schemeref is used to indicate the mapping of the temporary markers to the automatically-managed numbering. The syntax of the command is \chemschemeref [ $\langle temp-marker \rangle$ ] { $\langle label \rangle$ }, where  $\langle temp-marker \rangle$  is the marker used in the graphic, and  $\langle label \rangle$  is the name assigned to the compound by the user. By default, chemscheme will assume that  $\langle temp-marker \rangle$  consists of the marker plus a number, beginning at 1 and incrementing by 1 for each additional structure inside one float. Each replacement requires a separate \chemschemeref, all of which should appear before the relevant \includegraphics command.

An example will make usage clearer. In the example used in this document, the starting material is given label IMesHCl and the product is called IMes. As is shown in the next example, in the EPS file these are labelled TMP1 and TMP2, respectively. The automated package defaults are used.

```
\begin{scheme}[ht]
  \includegraphics{scheme-two}
  \caption{A scheme with temporary compound numbers.}
\end{scheme}
\begin{scheme}[ht]
  \schemeref{IMesHCl}
  \schemeref{IMes}
  \includegraphics{scheme-two}
  \caption{A scheme with automated compound numbers.}
\end{scheme}
```

If the marker text is given as an optional argument to \schemeref, it must

Scheme 3: A scheme with temporary compound numbers.

include the entire text to be matched.

```
\begin{scheme}[ht]
  \schemeref[TMP1]{IMesHC1}
  \schemeref[TMP2]{IMes}
```

Scheme 4: A scheme with automated compound numbers.

```
\includegraphics{scheme-two}
\caption{A scheme with explicitly numbered temporary labels.}
\end{scheme}
```

Notice that the new label is centred on the middle of the temporary marker, with

Scheme 5: A scheme with explicitly numbered temporary labels.

the same baseline. This should allow the user to obtain good alignment of labels and structures.

\schemerefmarker

When using automatic substitution mode, the "marker" text to be searched for is stored as \schemerefmarker, which has default value TMP. Thus the graphics should contain labels TMP1, TMP2, etc. The value can be changed using \renewcommand\*.

\schemerefformat

The format of chemical references is controlled by the underlying package, bpchem or chemcompounds. However, it is useful to be able to specify additional formatting for schemes. By default, chemscheme formats all reference numbers in a sans serif font. This is controlled by \schemerefformat.

```
% This needs the color or xcolor package loaded
\renewcommand*{\schemerefformat}{%
  \color{magenta}\textit
}%
\begin{scheme}[ht]
  \schemeref{IMesHCl}
  \schemeref{IMes}
  \includegraphics{scheme-two}
  \caption{A scheme with altered label formatting.}
\end{scheme}
```

\schemerefsub

The bpchem package allows tracking of sub-labels (1a, 1b, etc.). To allow use of these in schemes, the \schemerefsub command is provided. This takes an additional argument  $\{\langle sub\text{-}label\rangle\}$ , which is used to generate the appropriate text. When used with chemcompounds, this command will gobble its arguments and issue a warning; no substitution will take place.

tracking

The choice of using chemcompounds or bpchem can be made by giving

$$Mes \xrightarrow{\uparrow} N \xrightarrow{Mes} Br \xrightarrow{KO-t-Bu} Mes \xrightarrow{\downarrow} N \xrightarrow{Mes} Mes \xrightarrow{N} Mes$$

Scheme 6: A scheme with altered label formatting.

the key-value option tracking= $\langle package \rangle$  when loading chemscheme. This recognises the values bpchem and chemcompounds, with the later as the default.

# 7 Horizontal positioning of all floats

\floatcontentscentre \floatcontentscenter \floatcontentsleft \floatcontentsright The LATEX default is to position all float contents flush-left. There is no "hook" provided to alter this. The chemschem package therefore provides commands to align all float contents automatically. As the macro names make clear, \floatcontentscentre will make all floats centred (for users speaking U.S. English, the alternative spelling \floatcontentscenter is also available). The default behaviour is restored using the command \floatcontentsleft. Finally, \floatcontentsright is provided for use if needed. Notice that the float positioning commands should be given *outside* floating environments, and apply to all subsequent floats.

```
\floatcontentsleft
\begin{scheme}[ht]
  \includegraphics{scheme-one}
  \caption{A flush-left scheme.}
\end{scheme}
\floatcontentsright
\begin{scheme}[ht]
  \includegraphics{scheme-one}
  \caption{A flush-right scheme.}
\end{scheme}
\floatcontentscentre
```

Scheme 7: A flush-left scheme.

It is important to note that the positioning mechanism used here relies on a low-level hack of the LATEX kernel. This has been tested with the standard LATEX classes, the memoir class and the koma-Script bundled. Other document classes may not give the desired behaviour.

Scheme 8: A flush-right scheme.

# 8 Some thoughts on generating chemical schemes

#### 8.1 Overview

There are a number of ways of generating the graphical content of schemes. The choice of method will depend on what is available to the user, and how complex the schemes desired are. In this section, an overview of several approaches is given.<sup>3</sup> The package author, who is a research worker in a university, favours using ChemDraw as it is regarded by many synthetic chemists as the best tool for this job. However, this is clearly overkill for users requiring a single diagram on a one-off basis. ChemDraw is also a commercial package running only under Windows and MacOS X. The following is necessarily somewhat brief and selective.

#### 8.2 Macro-based methods

At the most basic, a chemical scheme is simply a collection of lines and symbols, as with any vector diagram. Hence, it is possible to construct schemes directly using packages such as PSTricks or pgf/Tikz. This is a complex method, and cannot be recommended for anyone except the very experienced and brave.

At a more practical level, there are two packages available which allow typesetting of chemical structures in TeX, using specialised commands: XyMTeX and ppchTeX. Recent versions of the XyMTeX package have not been made available on CTAN, and the version held there is therefore considered to be obsolete. On the other hand, the ppchTeX system, developed originally for ConTeXt, is available. Both systems suffer from the lack of chemical logic in the input: it is very hard to tell from the code what is being represented. Drawing items such as "curly arrows", or making subtle alterations to positioning, is very challenging in purely macro-based systems. For these reasons, it is usually much more sensible to examine the available graphical methods.

#### 8.3 Graphical methods

Moving to graphical systems, there is no reason that general-purpose vector drawing packages cannot be used for schemes. There are obviously several commercial (Coreldraw, Adobe Illustrator, etc.) and freeware (for example the GIMP) drawing packages that can be used in this way. Simply rings and lines can easily be constructed, although in general-purpose programs the user has to watch that all bonds are the same length.

<sup>&</sup>lt;sup>3</sup>Thanks to Norwid-R. Behrnd for suggesting this section and giving a number of useful examples and tips.

For producing a large number of complex schemes, the particular abilities of dedicated software become a necessity. As well as the already-mentioned ChemDraw, programs such as ISIS Draw and ChemSketch are available free for personal use;<sup>4</sup> these programs are all Windows specific. In the open-source arena, there are a number of packages such as XDrawChem and BKchem, which offer cross-platform functionality. The differences between the various packages are in the ease of use, and ability to generate well-formatted output (for example, aligning structures). A more recent addition to this group of packages is the cross-platform ChemDoodle, which look promising but is not free in any sense.

One which deserves mention for the TEX user is TpX. This is a general purpose Windows graphics program specifically aimed at producing TEX-friendly output (such as PSTricks and Tikz code) from a graphical interface. TpX can accept clipboard data from other programs, so can be used to produce EPS files from programs which do not have native export facilities (such as ISIS DRAW).

#### 9 Additional information

#### 9.1 Interactions with other packages

chemstyle and chemscheme are designed to avoid, as far as possible, clashes with other packages. The standard packages graphicx and varioref are used by the budnle. If you need to load these with specific options, this needs to be done *before* loading chemstyle (or chemscheme).

#### 9.2 Captions above floats

The scheme float type is generated using either the float or floatrow package. This has the side-effect that the placement of captions for floats does not depended on where the \caption command comes inside the floating environment.<sup>5</sup> If you wish to alter the placement of captions, the mechanism of the underlying package will be needed. There are some subtle differences between the two: although floatrow provides the float macros, they are not all 100% compatible. This document is compiled using floatrow, and so to fix the position of captions the following code is appropriate.

```
\begin{table}[ht]
  \fbox{First float contents}
  \caption{A caption below the float contents in the source.}
\end{table}
\floatsetup[table]{style=plain}
\begin{table}[ht]
  \fbox{Second float contents}
  \caption{A second caption below the float contents in the source.}
\end{table}
```

Using the float package, the same effect is achieved using:

```
\begin{table}[ht]
  \fbox{First float contents}
```

<sup>4&</sup>quot;Free" as in without charge, not as in open source.

<sup>&</sup>lt;sup>5</sup>Normally this is a good thing.

Table 2: A caption below the float contents in the source.

First float contents

Second float contents

Table 3: A second caption below the float contents in the source.

```
\caption{A caption below the float contents in the source.}
\end{table}
\floatstyle{plain}
\restylefloat{table}
\begin{table}[ht]
  \fbox{Second float contents}
  \caption{A second caption below the float contents in the source.}
\end{table}
```

#### 10 A demonstration file

This is a simple demonstration file for using the chemstyle package. By using the auto-pst-pdf package, it is possible to use EPS graphics with pdfIaTeX.

```
1 (*demo)
2 \documentclass[a4paper]{article}
3 \usepackage[T1]{fontenc}
                                      % Modern font encoding
4\usepackage[runs=2]{auto-pst-pdf} % Use EPS graphics with pdfLaTeX
5 \usepackage{booktabs}
                                      % Better table layouts
6 \usepackage[journal=rsc]{chemstyle} % Of course!
7 \usepackage{geometry}
                                    % Easy page laout
8 \usepackage{lmodern}
                                     % Use Latin Modern fonts
9 \usepackage[version=3] {mhchem}
                                    % Formula subscripts using \ce{}
10 \begin{document}
11 \end{document}
12 (/demo)
```

# 11 Change History

```
v1.0

General: Initial release of package . 1
```

#### 12 Index

Numbers written in italic refer to the page where the corresponding entry is described; numbers underlined refer to the code line of the definition; numbers in roman refer to the code lines where the entry is used.

```
A abbremph (option) . . . . 4 C abbrcomma (option) . . . . 5 \center{C}
```

\cmc 4	\listofschemes 7	radsuper5
\cstsetup 3	\listschemename 7	tracking 9
		xspace 6
E	M	•
\eg 4	\mmHg 4	P
environments:	\Molar 4	phrases (option) 5
scheme $\dots 6$	\molar 4	1 (-1 )
\etal 4		R
\etc 4	N	rademph (option) 5
	\nBu 5	radhyphen (option) 5
F	nonotes (option) 3	
\floatcontentscenter 10	nophrases (option) 5	radprefix (option) 5
\floatcontentscentre 10	notes (option) 3	radsuper (option) 5
\floatcontentsleft . 10	notesbefore (option) 3	
\floatcontentsright 10	\nPr 5	S
floats (option) 7	,,	\sBu 5
,	0	scheme (environment) 6
Н	options:	\schemename 7
\Hz4	abbrcomma 5	\schemeref 8
	abbremph 4	\schemerefformat 9
I	floats 7	\schemerefmarker 9
\iBu 5	journal 3	\schemerefsub 9
\ie 4	nonotes 3	\standardstate 4
\invacuo 4	nophrases 5	·
\iPr 5	notes 3	T
T	notesbefore 3	\tBu 5
J	phrases 5	tracking (option) 9
journal (option) 3	rademph5	ordoning (option) 9
I.	radhyphen 5	x
~	••	,,
\latin 4	radprefix 5	xspace (option) 6